Range of mountains. The main stream, after receiving a number of tributaries rising to the southward in the Raton Mountains, empties into the Arkansas two miles east of Las Animas. Although draining 3040 square miles, the stream normally carries very little water; in fact, it is almost dry in its lower part, especially during summer and autumn.

In Colorado rain set in over the drainage area on the 27th and continued until the afternoon of the 30th. Along the Arkansas the fall was generally between one and two inches, while on the watershed of the Purgatoire, in Huerfano and Las Animas counties in Colorado, and in northern New Mexico it ranged from about four inches in the western part of Las Animas County to nearly six inches in the vicinity of Trinidad, and to about seven inches near the headwaters of the tributaries rising in the Raton Mountains in northern New Mexico. The entire upper watershed being a mountainous region, the run-off was great and rapid.

At Trinidad, where the flood was most disastrous, the loss probably reached $600,000. The river rose very rapidly; at 2 a. m. of the 30th it went over its banks, and at 3:30 a. m. it had spread a block or more on each side. Every bridge in the city, except one, was carried away; the Santa Fe railroad station was demolished, and 30 city blocks along the river were covered from two to four feet deep. The electric light and gas plants were flooded, leaving the city in darkness. The railroads sustained a large loss by washouts and a prolonged interruption to traffic. Ranchmen along the river for 50 miles or more lost their crops; in some instances they sustained considerable loss by the cutting done by the flood, and in others sand ruined much valuable farming land.

Before the flood in the Purgatoire reached the Arkansas that stream was somewhat swollen as a result of the rains, but the volume carried did not exceed 3000 second-feet. The great volume brought by the Purgatoire caused the Arkansas to leave its banks and attain a height equal to the high-water mark reached about 40 years ago. All bridges between Las Animas and the State line, except one at Granada, were washed out; bottom lands were badly washed or covered with sand; long stretches of railroad track were carried away or undermined, the damage being estimated at $200,000. At Lamar, about 30 miles east of the mouth of the Purgatoire, the flood stages were first noted about 6 a. m., October 1, and the water continued to rise steadily until 4 p. m. At the highest stage the river was fully one and a half miles wide. The river subsided slowly from that time until Tuesday, when it was again at its normal stage.

RECENT FLOODS IN THE RIO GRANDE VALLEY.

By W. H. ALEXANDER, Observer, Weather Bureau, Galveston, Tex.

The continuous and at times heavy rains that fell over western and southwestern Texas and southeastern New Mexico during September and the early part of October, 1904, kept the Rio Grande on the verge of overflowing its banks at various places along its course during this entire time, and on several occasions, and at a number of places it did overflow and flood the valley. The property loss in Texas on account of these overflows seems not to have been very great, but the inhabitants of the valley were kept in a state of constant alarm.

On the 8th of September the river observer at Eagle Pass, Tex., sent the following message to points below:

River up seven feet and rising. Heavy rains reported above here.

On the 14th the following:

River now up sixteen feet, and rising six inches per hour. Eight a. m.

On the 15th the following:

Twenty-two feet. Slowly rising. Continued light rains here.

On the 16th the following:

Reached twenty-four feet last night. Now falling.

From gage readings kindly furnished by Mr. W. W. Follett, United States Consulting Engineer, El Paso, Tex., it appears that the river at El Paso gradually rose from September 1 to 15, after which a gradual fall began. The highest reading recorded was 14.0 feet in the afternoon of the 15th.

Another series of readings from a gage located near Devils River Station, Tex., shows a gradual rise in the river from September 5 to 10, and a very rapid rise from the 10th to the 15th. The maximum reading recorded at this station was 28.1 feet on the afternoon of the 14th and the forenoon of the 15th. Gage readings at Fort Ringgold, Riogrande, Tex., show that the river at that point rose from 20 feet on the 10th to 30 feet on the 16th, and then began to fall.

The postmaster at Delrio, Tex., advises that the river at that point overflowed its banks on the 12th and 13th of September to a depth of seven feet, the water extending from 300 to 700 yards from the river bed, and causing an estimated property loss in that immediate vicinity of $500.

At Riogrande, Tex., the river overflowed its banks from September 16 to 22, resulting in the complete destruction of all crops planted along the river valley and a number of small shacks or huts. The crops destroyed were largely on truck farms, although a few cotton fields were also destroyed. It is intimated that the losses were heavier farther down the river, but no authentic information relative thereto has been received at this office.

During the last week of September very heavy rains fell in the upper Rio Grande Valley, especially in New Mexico, causing an overflow of the river in the vicinity of El Paso, Tex., and above, resulting in the loss of considerable property, principally railroad property, along the river in southern New Mexico. Just above El Paso a dike gave way and the water spread rapidly across and down the valley, forming lakes and streams, a part finally returning to the river channel. The damage to lands and buildings by reason of this overflow is estimated at $5000 or less.

On October 15, 1904, the observer at El Paso, Tex., advised the stations below as follows:

No decided rise in surface of river last three or four weeks, but bottom has scoured out until average depth at point of average width appears to be seven or eight feet and water running fast.

The gage readings at El Paso show that the highest stage, 24.0 feet, was reached at 11 p. m. of the 15th of October. No authentic information has been received at this office of damages, if any, resulting from this rise in the river. They are believed to have been unimportant.

THE GREAT FLOODS OF SEPTEMBER IN NEW MEXICO.

By J. B. SLOAN, Observer, U. S. Weather Bureau, Santa Fe, N. M. *Revised reprint from* Report for September, 1904, New Mexico Section of the Climate and Crop Service of the Weather Bureau.

Between the 26th and 30th of September very heavy, steady rains fell over nearly the entire Territory, causing the most extensive and destructive floods in its history. The greatest damage occurred on Thursday morning, September 29, over the eastern slopes of the mountains and along the valleys and lowlands of the northern portion, but the floods were nearly as destructive over the eastern slope of the several mountain ranges in the southwest portion, and over the Hondo basin in the southeast. The reports from the voluntary observers show that from three to seven inches of rain fell in twenty-four to forty-eight hours, extending over an area about three hundred by five hundred miles. It is simply impossible to conceive the volume of water which this means; millions of tons, all rushing toward the sea, down the steep canyons and rapidly decreasing slopes of the valleys, carrying death and destruction in its path, for nothing placed by man can withstand the onward rush of the flood waters. An eye witness of a portion of the flood gave a vivid description of the meeting of the Mora and Sapello rivers, about a quarter of a mile above Watrous, in the following words:

Both streams were raging torrents. As they came together at an angle of about 45° the waters were hurled high into the air with a roar almost like Niagara; the two streams forming a veritable maelstrom as the monster currents struggled for the mastery. Swirling and tossing on the breast of the flood were heavy timbers, great cottonwood and pine trees, and fragments of roofs, fences, and corrals. It was a terrible and awe-inspiring sight. Just below the juncture of the streams they were hurled against the Santa Fe tracks, obliterating them as far as one could see. Half a mile down the valley stood the great steel bridge lately constructed. The big structure towered like a monarch above the floods, with the approaches on both sides gone, but supported by the two massive stone abutments. For a moment beneath and on both sides the flood rushed on its mad course of destruction, soon carrying the bridge and everything in its path.

On the terrible Thursday morning those who looked from the heights above Watrous gazed over five miles of wild, raging sea, which threw columns of spray high into the air and whose roaring would have silenced the sound of the most violent tempest on the iron bound shores of the Bay of Fundy. Past all imagination, conception, or belief, say those who witnessed the spectacle, was the fury of the flood at the confluence of the Mora and Sapello rivers.

Many homes throughout the Territory were carried away by the rushing, turbulent waters, overflowing from the canyons, arroyos, creeks, and rivers. Towns and cities were inundated and covered with water four to ten feet deep; rich farming lands and orchards were devastated, alfalfa fields washed out, and hay and grain destroyed, after having been cut and stacked. Over the ranges the low-lying meadows were covered with silt and mud, in places to the depth of several feet, rendering them useless for grazing, but the loss of live stock was not extensive. Many lives were lost in the isolated villages and numerous narrow, fertile valleys of northern New Mexico, but the exact number is not known.

In one of these narrow valleys, the Turquillo, in Mora County, noted for its beautiful meadows and fine crops of wheat, oats, barley, corn, hay, and alfalfa, with numerous canyons running into it from the adjacent mountains, the storm continued for four days and nights, increasing the volume of water every hour, and terminating in a flood that swept the valley. In places the flood was over a half mile wide and deep enough to cover thousands of cocks of hay, leaving only the crowns to be seen. At one point farther up the valley a lake of about five hundred acres was formed, and there it will remain for many weeks, as there is no outlet for the water.

Probably the greatest orchard loss was that of Mr. M. W. Mills, near Springer, which approximates $50,000. At his orchard ranch the bottom of the canyon was flooded to a height of 45 feet. The dam and head gate of his irrigation ditch were carried away, and the seven miles of the main ditch filled with sand, gravel, and rocks, including two miles of the fifteen-foot cut. The orchard at this point contained about 10,000 peach, 2000 apricots, 2000 almonds, 3000 cherry, plum, and other trees; nearly all were swept away, leaving only a few trees standing. The small fruits, berries, grapes, etc., were inundated and partly destroyed. On the lower side, farther down, about half way up the hill, about one-half of the apple and pear orchard was washed out, leaving only a narrow strip of trees. This fine orchard is practically a total loss, as that left is not considered worth the $10,000 that would be required to rebuild the irrigation ditch. Thousands of other trees, some estimated to be over 2000 years old, were carried down in the raging torrent. The river bed at this point is three times as wide as heretofore.

To illustrate the volume and force of the water the following facts are mentioned. In the Mora canyon, a few miles above Shoemaker, six miles of track and several bridges were washed out. In one place the river flows through a box canyon with high walls, and the railroad had been built through this canyon, but some distance above the ordinary level of the stream. The whole track was lifted bodily out of the long, narrow, winding, box canyon and hurled two miles farther down on the Shoemaker ranch. That it was done is apparent, but how can not be explained. Near Logan, spanning the Canadian River and belonging to the Rock Island Railroad, is one of the highest bridges in the west, 135 feet above the low-water mark. It was several hundred feet long, built of steel and thought to be strong enough for any purpose, but more than two hundred feet of the steel structure is missing, having been carried by the flood, which rose until it splashed over it, to the sand bars below. A portion of the bridge was saved by running a heavily laden train of coal cars upon it. Over the adjacent mountains and in the Santa Fe Valley the rainfall was the heaviest on record. On Thursday evening, within two hours after the flood first struck the protecting dam of the reservoir, three miles east of Santa Fe, 250,000,000 gallons of water had passed into it and were rushing over the spillway, 175 feet long, at a height of three feet.

At the same time the open ditch, built on the south side of the reservoir, to dispose of flood waters and having a capacity of 750 cubic feet per second, was running bank full, in places even overflowing. It was estimated from subsequent measurements that when the crest of the flood reached the upper or protecting dam, the river was running about 2000 cubic feet per second, and it continued at this rate into the night. About 9 o'clock the following morning the water was flowing over the spillway to a depth of 32 inches. Twenty-four hours after the flood waters reached the reservoir the flow measured 750 cubic feet per second. On Sunday, the fourth day, it had diminished to 400 cubic feet, and on the 10th day it was still flowing 100 cubic feet per second. The grade of the river for eighteen miles above the reservoir, according to survey, averages 125 feet to the mile, and, when this is taken into consideration, the long continued heavy flow is remarkable and can not be accounted for unless it was due to hail that fell in immense quantities in the higher mountain ravines and canyons and slowly melted, as it is known that hail fell in the canyon above the reservoir.

Table showing daily and total precipitation during flood period (in inches and hundredths).

Stations.	September, 1904.					Total.
	26	27	28	29	30	
Alamogordo	.....	.80	.55	.75	.....	2.10
Albert	.10	.....	.22	2.40	1.54	4.24
Albuquerque	T.	.....	.....	.86	.....	0.86
Arabela	T.	.08	.51	2.70	1.88	5.17
Bell Ranch	.....	.....	T.	2.17	1.87	4.04
Cambray	.....	.....	1.25	.80	.....	2.05
Carlsbad	.....	.....	.....	.95	.....	0.95
Cloudcroft	.10	2.80	1.40	.90	.....	5.20
Deming	.16	.....	1.20	1.10	.....	2.46
Dorsey	.....	.50	.96	2.65	2.77	6.88
Eagle Rock Ranch	.90	.19	*	2.30	3.61	7.00
Elk	.....	.....	.....	3.43	.38	3.81
Engle	.....	4.20	1.00	.....	.....	5.20
Fort Bayard	T.	.....	.74	.56	.....	1.30
Fort Stanton	T.	.....	1.00	2.00	2.86	5.86
Fort Union	1.80	.70	1.50	2.30	.....	6.30
Hillsboro	.09	.....	*	3.25	.....	3.34
Las Vegas	.05	.10	.26	2.87	1.77	5.05
Los Lunas	.....	.....	.....	1.85	.....	1.85
Mesilla Park	T.	T.	1.63	.....	.....	1.63
Mountainair	T.	.....	.25	1.56	.10	1.91
Raton	1.50	.80	1.10	3.88	.....	7.38
Rociada	T.	.60	*	4.52	2.80	7.92
Roswell	.....	.....	.42	.75	.....	1.17
San Marcial	.....	.....	.....	2.00	.....	2.00
Santa Fe	.17	.33	.....	1.08	1.43	2.81
Springer	.....	.50	.30	3.10	1.50	†5.40
Socorro	.21	.....	.....	3.61	.....	3.82
Strauss	.....	.....	.60	.55	.....	1.15
Taos	.23	.....	*	1.62	.....	1.85
Vermejo	.05	.37	.63	2.30	1.60	4.95
W. S. Ranch	.86	.62	1.50	3.67	.01	6.66
Amarillo	.....	.....	1.68	.26	.....	1.94
El Paso	.....	T.	.13	.92	.02	1.07
Averages	.18	.37	.56	1.87	.71	3.69

* Amount included in following day. † Incomplete.

Without the protection of this reservoir, which holds about 450,000,000 gallons of water, the damage to the city of Santa Fe would have been enormous. A few miles below the city the river bed for about twelve miles was widened to 60 feet and cut 30 feet deep, forming an impassable barrier.

The most extensive damage was done to the various railroads throughout the Territory, and undoubtedly exceeds $1,000,000. Miles upon miles of track and numerous bridges were carried away or damaged. Passenger and freight business was stalled or interrupted for several weeks, and towns and cities were isolated and cut off from supplies and mail. Telegraph wires were prostrated in all directions and local offices were not in direct communication with the terminal cities for over two weeks, although messages were detoured to the principal New Mexico cities over patched wires within a few days after the storm subsided.

At the present writing it is impossible to definitely state the aggregate loss in the cities, towns, and small settlements, or to the farms and ranches throughout the Territory, but it is believed $1,000,000 is a conservative estimate.

The accompanying table shows the daily rainfall of the flooded districts. It will be observed that the precipitation over the entire area approximated two inches on the 29th, the day of the greatest flood disaster, and that the total for the five days was practically four inches, while in the stricken northeast quarter of the Territory six inches occurred within this period.

NOTES AND EXTRACTS.

ROYAL METEOROLOGICAL SOCIETY.

We are informed that His Royal Highness the Prince of Wales has graciously consented to become patron of the Royal Meteorological Society.

Those who are familiar with the history of the New England Meteorological Society, its rapid growth and great usefulness, but eventual dissolution, and with other efforts to establish a similar vigorous society in this country and elsewhere, must have wondered why such efforts often came to naught, but the reasons are not far to seek. A society will not live a healthy life unless, like a man, it has plenty of exercise and useful work to do, and funds to pay expenses, and the stimulus that comes from the conviction that it is really accomplishing its work. What is so discouraging as to strive for a mountain top, yet find oneself perpetually laboring along in ravines and valleys. One must have an occasional outlook from a peak in order to feel that he is steadily nearing the summit; every descent into a valley must be made with the assurance that the next greater height will be attained beyond. So with a society of men banded together for a definite purpose, the initial enthusiasm and money will not suffice unless the members can see that progress is being made toward the object in view; the attainment of one point must be followed by striving after another just beyond. Thus it is that the best scientific research is stimulated step by step; one climbs and enjoys each point of view. What use have we for a society that has no special work to prosecute, no great object to attain, no vigorous life?

Happily for the Royal Meteorological Society of London it has done good work, and its leading spirits foresee that there is more yet to be done. A friend familiar with the development of meteorology in England tells us that—

> There has been a good deal of effort made in England since Dr. W. N. Shaw became chief of the weather service to raise the whole tone of meteorological investigation in England. This has taken the form partly in the direction of inducing the government to reorganize the Meteorological Office and spend larger sums on its maintenance, and partly in the direction of raising the standing of the Royal Meteorological Society.
>
> Sir John Eliot is just now working hard to induce the government to consider a plan of cooperation for the whole British Empire in dealing with meteorological observation (see his British Association address) and a good deal of work of this kind is evidently going on behind the scenes. I take it that the fact of the Prince of Wales becoming a patron is a "straw" which shows that some success is being achieved in persuading the government of the importance of the work to be done; there has been in the past and seems likely to be more in the future of cooperation between the Government Meteorological Service and the Meteorological Society. There is usually a good deal of care and inquiry made as to the standing of any society of this kind before a member of the royal family becomes a patron.—*C. A.*

JOURNAL OF THE METEOROLOGICAL SOCIETY OF JAPAN.

The last number of the Journal of the Meteorological Society of Japan, Tokio, September, 1904, 23d year, No. 9, contains the following announcement:

> The Meteorological Society of Japan, founded in 1882, counts at present more than 260 members. The president of the society is His Excellency Vice-Admiral Viscount Yenomoto. Its organ is the Kishoshushi (Meteorological Journal), of which more than 180 volumes have already been published. The language used in this journal has hitherto been exclusively Japanese; but, in the future, it is intended to insert occasionally articles on Japanese meteorology as well as other scientific matters in English, French, or German.
>
> It is earnestly desired that our readers will favor us with contributions to our journal.

The only article in this number in any European language is by T. Okada, and is entitled "On the underground temperature observations made at Nagoya, Japan." Observations of ground temperature were made at various depths up to twelve meters, for periods varying from ten years for the lesser depths to four years for the greatest. The soil is a mixture of sand and loam, with a surface of sod. The author decides that the diffusivity, which differs widely in different strata, is greatest at a depth of one and one-half to three meters, where it amounts to 0.00899, and that the stratum of invariable temperature is found at about twelve meters.

The remaining articles of the September number, all of which are in Japanese, are as follows:

"On the snow temperature observations made at Sapporo." By K. Abe.

"Fishery and climate in the Inland Sea for the year 1904." By Y. Yamaguchi.

"On the connection between earthquakes and atmospheric pressure." By Hioya.

"On lunar phases and weather." By Seisan.

"Climate and the development of silkworms at Fukuoka and Kanayama in 1904." Kanayama Meteorological Station.

"Notes: Monthly weather review for August."—*F. O. S.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. James L. Bartlett, Observer, Madison, Wis., gives the following brief outline of the course in meteorology that he will offer at the University of Wisconsin during the second semester of the present college year:

1. The principles of meteorology. The properties and phenomena of the earth's atmosphere, including barometric pressure, temperature, precipitation, fog, dew, frost, clouds, the general circulation of the atmosphere, and general and local storms. The weather and climate of the United States.

2. Explanation of the meteorological apparatus in use at the Weather Bureau office, and instruction in its use. Instruction and laboratory work in taking and recording observations.

3. Instruction in the preparation and use of the weather map, forecasts, and warnings. Laboratory work in drawing isobars and isotherms and in making forecasts of the weather.

Mr. Edward L. Wells, Observer, Boise, Idaho, on October 21 addressed several classes from the public schools of the county. The structure and use of the instruments were explained, the methods of collecting and disseminating meteorological information were described, and methods of forecasting were touched upon, with some reference to the fallacy of long-range forecasting as at present attempted.